3. Subbasin Assessment – Pollutant Source Inventory

The sources of the pollutants cited as causing water quality standards exceedances for the 303(d)-listed water bodies are identified and discussed in detail in this section. Pollutant sources may occur as point sources, which are regulated by the National Pollutant Discharge Elimination System (NPDES) program or as nonpoint sources of pollutants, which are not subject to NPDES or any other permitting programs. Point sources have a discrete conveyance, such as a pipe, ditch, or other identifiable “point” of discharge into a receiving water while nonpoint sources are pollutants coming off the landscape having no one exact point of discharge. Common point sources of pollution are industrial and municipal wastewater facilities. Examples of nonpoint sources include logging activities, roads, grazing activities, agricultural activities, and landslides (mass failures). There are several point sources in the basin; however, none of these occur on any of the 303(d) listed water bodies. Since these point sources do not contribute to the 303(d) listed water bodies they were not factored into TMDL development.

3.1 Sources of Pollutants of Concern

All of the 303(d) listed water bodies have sediment, temperature, nutrients, and bacteria listed as a possible pollutants. Potential sources of sediment, excluding natural background in the basin, include in-stream erosion, roads, agriculture, logging, and grazing activities. The source for temperature is solar radiation, i.e., the sun. Possible sources for nutrients include natural background, agricultural sources, grazing sources, septic systems, and storm run-off. Potential sources of bacteria include grazing activities, septic systems, wildlife, and humans. These sources and the cause of these pollutants will be discussed in more detail in the following section.

Point Sources

There are no point sources on the 303(d) water bodies in this report.

Nonpoint Sources

The primary reason that streams in the Palouse River Subbasin were 303(d)-listed was because of nonpoint source pollutants. One way to classify nonpoint sources would be to divide them into two categories: anthropogenic (human caused) and non-anthropogenic (non-human caused). Anthropogenic sources include road building, logging activities, construction activities, agricultural activities, grazing, recreational activities, and fire. Non-anthropogenic sources include natural mass failures and other erosional processes, wildlife impacts and fire. Fire can be both anthropogenic and non-anthropogenic.

In the following section, sediment, heat, nutrients, dissolvedoxygen (DO), and bacteria loading sources are discussed. A discussion of transport mechanisms for these pollutants is also included.
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Sediment

All six listed water bodies in the Palouse River Subbasin are listed with sediment as a pollutant. Nonpoint sources of sediment in the Palouse River Subbasin include forest management activities, road and trail construction and maintenance activities, agricultural activities, grazing activities, landslides, in-stream erosion, fires, other past and present land management activities, and air deposition. The precise amount of pollutant contribution from each of these nonpoint sources to the subbasin is unknown, as it is nearly impossible to determine the exact amount from each source. However, all the significant sources of sediment— agriculture, grazing, forestry, roads, and in-stream erosion—were quantified for TMDL loading calculations. More specifically, activities such as tilling, grazing, plowing, construction, road construction, road reconstruction, road maintenance, timber harvesting, thinning, fertilization, and fire suppression affect the erosion rates that would occur naturally in the basin. These activities may result in increased erosion and sedimentation. At the same time, some activities like road obliteration and road re-construction may reduce the amount of sediment to water bodies.

Sediment is transported by numerous methods:

- The majority of sediment transport occurs during precipitation events, when bare soil is eroded and water moves sediment off the landscape into and through natural and man-made ephemeral areas and into intermittent and perennial streams.

- Mass failures tend to occur during or after storm events, as supersaturated soil becomes mobile.

- Roads can be the primary paths for transporting exposed sediments into water bodies.

- In urban areas, during and after precipitation events, water typically does not get absorbed into the ground due to compacted or paved areas. This water drains into some kind of drainage system and typically, but not always, flows into nearby empheral, intermittent or perennial streams.

Any new construction activities over one acre in size are required to obtain a National Permit Discharge Eliminate System (NPDES) permit from the Environmental Protection Agency (EPA). This permit ensures that Best Management practices (BMPs) are followed to minimize excess sedimentation into water bodies.

In the Palouse River Subbasin sediment within streams comes primarily from three sources: the landscape, roads, and bank/ in-stream erosion. Determining the quantity of sediment that comes from these sources was accomplished via modeling and measurement:

- The RUSLE model was used to quantify sediment amounts off the landscape. Erosion off the landscape includes agricultural production, urbanization, silviculture activities, and grazing.

- The WEPP model was used to quantify sediment amounts from roads.

- The NRCS in-stream erosion field estimate protocol was used to quantify in-stream erosion from the banks. Some in-stream erosion is natural; however, anthropogenic activities in the Palouse River Subbasin have accelerated this process. Activities such as grazing, structural riparian changes such as dredging and straightening channels, recreational activities, and road building have all altered in-stream erosion in some fashion.

- In the end, the sediment numbers used for TMDL loading calculations were based on the sediment physically collected at the established monitoring sites on a bi-weekly basis from November 2001 through November 2002. The sediment data was then added to a stochastic flow model based on ten years of flow data collected on the Palouse River near the town of Potlatch by the USGS. This model as well as the other sediment models can be used as a references or starting points after implementation of the sediment TMDL.

- Some general notes on modeling, including sediment modeling. All models inherently have some range of error associated with them, some even around 50% or more. The exact output or end result of a model are not necessarily the most important feature, but observing trends over a unspecified period of time are perhaps more important. For water quality, streams must meet beneficial uses regardless of the output or percent reduction the model(s) predicted. It could be possible to meet the beneficial uses and not meet the exact percent reduction within a model, and conversely the reverse is true. Models were used in a fairly reliable and repeatable process to obtain an estimate of the amount of a specific pollutant in order to create a TMDL. DEQ believes the models used in this report can be used again after an unspecified period of time or several times in the future to observe trends in a pollutant. As with all technologies and within the field of science itself, new ideals, principles and beliefs will inevitable come, therefore new models or new methods will probably be used to solve issues addressed within this document.

Map 1-6 (page 25) shows the distribution of roads in the subbasin, most of which are unpaved. Roads contribute to sediment in the Palouse River Subbasin in the following ways:

- Within timber management areas, road erosion is known to be the primary source of sediment to water bodies. Roads directly affect natural sediment and hydrologic regimes by changing the landscape. For example, road prisms near a stream have the potential to alter stream flow by confining the channel, reducing the floodplain storage, increasing sediment input to the stream, removing riparian vegetation, changing channel morphology, decreasing channel stability, and altering substrate composition.

- Culverts also impact the landscape, as they tend to confine the stream channel, and, without proper maintenance or if improperly installed or improperly sized, can fail during high flows and deliver large amounts of sediment to the stream. These failures, along with road-related surface erosion and mass failures can continue for decades after the roads are constructed.

- Road-stream crossings can also be major sources of sediment to streams, resulting from channel fill around culverts, road surface drainage to crossing areas, and crossing failures. Road construction techniques have improved tremendously over the past few decades and will continue to improve. Roads engineered and constructed properly with these new techniques have significantly decreased sedimentation inputs to water bodies from roads, and older roads are typically obliterated.

Mass failures are the other sediment source in the subbasin, but no large mass failures were observed. Smaller road slumps and failures were noted and taken into consideration using the WEPP and in-stream erosion models.

Field observations conclude that grazing activities contribute to riparian area denudation and, possibly, to the overall sediment load within the Palouse River Subbasin. Potlatch Corporation and IDL have grazing leases throughout the Palouse River Subbasin. All of the 303(d)-listed water bodies have some grazing impacts to their riparian areas.

Gravel is mined for road construction and surfacing at several sites within the subbasin. Most of these sites are away from riparian areas and streams; however, there are some sites that could use improvement.

There are no current permitted mining activities in the subbasin. Most sediment from mining activities resulted from placer mines in the last half of the nineteenth century. The result is cobble-sized material along the banks of some streams as stream channels reestablish their normal meander patterns.

Recreational activities like hiking, camping, hunting, horseback riding, bicycling, off-road vehicle use, fishing, swimming, cross country skiing, snowmobiling, and scenery and wildlife viewing may contribute to erosion and sedimentation. Most of these activities do not produce significant amounts of sediment. Determination of the specific amount of sedimentation caused by these activities would be very difficult, time consuming, and costly—they were therefore not calculated. However, the NRCS in-stream field estimate methodology does account for recreational activities within the riparian areas. The collection of TSS and NTU data in the field also addresses recreation activities impacting streams. (It is noted that litter from recreational activities can be significant, at times, in many areas in the Palouse River Subbasin.)

Some sediment comes from air deposition in the form of fine particle dust from fires, roads, and administrative activities in the subbasin. Some of these contributors, such as large fires, produce significant amounts of airfall at times, but for sediment assessment purposes in this document, DEQ concluded sedimentation from air deposition is insignificant.

Erosion in some areas of the rolling hills of the Palouse within the Palouse River Subbasin is enormous. The Palouse has been called one of the most erosive areas in the United States (Beus, 1990). The USDA estimated that from 1939 through 1977, the average annual rate of soil erosion in the Palouse was 14 tons/acre on cultivated cropland. This is not the amount that reaches a waterbody—just the amount displaced from the slopes.

In the 1930s and 40s, as much as 100 tons of soil could be washed from an acre in one storm (Sorensen, 2002). Some researchers believe that 40% of the soils have been lost to erosion (Pimentel and others, 1995). It takes 300 to 1,000 years to create one inch of topsoil, but the average loss on the Palouse since the 1920s is one inch per twelve years (Soule and Piper, 1992).

Another way to look at background soil erosion rates on agricultural lands is to run the revised universal soil loss equation (RUSLE) model, using a vegetation community that resembles a natural vegetation community. Table 3-1 displays the average background rate that was used in TMDL loading calculations.

Table 3-1. Sediment background numbers

Watershed	Size (acres)	Size ($mile^2$)	Amount (tons/acre/yr)	Amount (tons/$mile^2$ /yr)	Amount (tons/yr)
Big	10300.72	16.09	0.11	72.96	1174.28
Deep	27315.56	42.68	0.09	58.05	2477.52
Flannigan	12246.82	19.14	0.12	79.55	1522.28
Gold	18069.78	28.23	0.11	71.17	2009.36
Hatter	16163.44	25.26	0.10	66.18	1671.30
Rock	5174.76	8.09	0.12	74.50	602.34

Forested natural background erosion rates tend to be lower than erosion rates for prairie areas. Forested areas will only erode above the natural background when there are ground disturbances such as logging, road building, fires, off road vehicle traffic, trail riding, etc. The Clearwater National Forest uses a background rate of 25 tons per square mile (0.039 tons per acre) (Wilson et al 1982). The Nez Perce National Forest uses background rates of 10-80 tons per square mile. Some researchers think these rates are too low, as they do not account for large pulses due to fires and major mass failure events. (The rates in Table 3-1 seem reasonable, as these are close to the rates used by the Clearwater National Forest and the Nez Perce National Forest.)

Measurements indicate that conventional background measurements may be 17 times lower than what is actually happening on certain mountainous landscapes in the Idaho Batholith on a geological time scale (periods of at least 10,000 years) (Kirchner et al 2001). Incremental erosion prevails most of the time, but accounts for very little of the overall sediment yield. Catastrophic erosion events, although extremely rare, dominate the long-term sediment yield. In fact, 70% to 97% of sediment delivery must occur during these episodes. Conventional sediment yield measurements are ineffective at measuring these catastrophic events due to the enormous size and infrequency of these events. With these recent discoveries, it would appear that human activities have contributed very little to the long-term sediment yield, but, as has been suggested by the research, human activities can still alter the frequency or size of these catastrophic events.

In conclusion, the major sources of sediment in the Palouse River Subbasin considered significant for this assessment are *off the landscape*, which includes natural background, agricultural activities and grazing activities, roads, and in-stream erosion sources. The effects of increased sedimentation to water bodies from mining, recreation, administrative activities, and air deposition are observable at times, but many orders of magnitude less significant; therefore, would not be given a loading amount if it is determined a TMDL is necessary.

Temperature (Heat Sources)

All six water bodies in the Palouse River Subbasin are 303(d)-listed for temperature, and the heat source is solar radiation from the sun. This is a natural condition. The question in point is what amount of additional solar radiation is occurring due to anthropogenic activities. Additional heat being absorbed by a water body, beyond background in forested environments, is usually a function of shade reduction. The water bodies that are listed for temperature have been altered by land use changes that suggest the following:

- A reasonable conclusion would be that an additional heat load to these streams has resulted from decreased stream shading by removing the canopy cover from these water bodies.
- Another reasonable conclusion is that the snow pack is decreased each spring season, earlier than what occurred naturally because of land-use changes.

Some evidence exists that canopy removal over broad sections of a watershed may increase flows in the early part of the season and result in lower flows in the latter part of the season when air temperatures are highest. Other evidence exists in watersheds, with deep, permeable vadose zones and vegetative covers with large evapotranspiration potentials, that canopy removal may result in increased flows throughout the year. If flows are lower in the summer, following the removal of the watershed canopy, higher stream temperatures could be the one of the results.

However, flow modification is not a pollutant under the CWA; therefore, lower flows and possible flow modifications are not fully addressed. A recommendation for land managers to possibly reduce stream temperatures would be to include methods to increase late season flows thereby reducing temperatures.

Higher early season flows could possibly result in channel widening and subsequent increased heat loading. This results in an increase of the surface area of the water to receive solar radiation. In most cases within the Palouse River Subbasin, where higher width to depth ratios are thought to have developed as a result of human activity, the altered ratios are primarily the result of road construction, mining alteration, or the removal of streamside vegetation that kept the channel narrow and sinuous.

Temperature data from streams that are not 303(d)-listed for temperature in Palouse River Subbasin indicates that water temperature exceedances are very common in the summer months. A recent report about water temperatures in the Lochsa watershed concluded that restoration strategies to generate full potential canopy cover in riparian areas throughout the Lochsa River Watershed would decrease average and maximum water temperatures—but not enough to satisfy Idaho cold water aquatic life temperature criteria (HDR, 2001). This is likely the same case in the Palouse River Subbasin. Therefore, DEQ used the Potential Natural Vegetation (PNV) model for the temperature TMDLs. This methodology, described in detailed in Chapter 5, will use the narrative natural condition state standard as a temperature target instead numeric criteria.

Nutrients

All six listed water bodies in the Palouse River Subbasin are 303(d)-listed for nutrients. Nutrient sources for these water bodies include fertilization from various source but mainly agriculture, grazing activities, residential sources and natural sources. The Idaho general surface water quality criteria states that, "Surface waters must be free of excess nutrients that cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses." A numeric standard for DO of 6.0 mg/L applies as well. A nutrient target of 0.1mg/L and DO levels above the 6.0 mg/L was established for the growing season (May-October).

Nutrients are essential for life, especially for the primary plant growth nutrients, and are ubiquitous in the environment. Because of their key role in ecosystem function, excessive levels of nutrients affect aquatic systems in a wide range of ways. Many types of human activities, particularly those associated with human or animal waste disposal or fertilizer application, can result in excessive loading of nutrients to water bodies and, for this reason, nutrient-related impairment is a widespread problem.

Excessive inputs of nitrogen and phosphorus have been known to impair aquatic life and/or salmonid spawning beneficial uses. These excessive nutrient inputs lead to excess growth of algae, which can deplete oxygen in the water that is needed by other organisms. Potential nutrient sources include faulty septic systems, agricultural and urban runoff, and livestock.

Phosphorus is one of the key elements necessary for growth of plants and animals. Phosphorus, in elemental form, is very toxic and is subject to bioaccumulation. Phosphates, such as PO_4, are formed from this element. Phosphates exist in three forms: orthophosphate, metaphosphate (or polyphosphate) and organically bound phosphate. Each compound contains phosphorous in a different chemical formula. *Ortho* forms are produced by natural processes and are found in sewage. *Poly* forms are used for treating boiler waters and in detergents. In water, they change into the ortho form. *Organic* phosphates are important in nature; their occurrence may result from the breakdown of organic pesticides, which contain phosphates. They may exist in solution, as particles, loose fragments, or in the bodies of aquatic organisms.

Phosphorus can be soluble or particulate in water. Two forms of phosphorus commonly measured in laboratories include soluble reactive phosphorus, which is dissolved in water, and total phosphorus, which includes both soluble and particulate forms. Unlike nitrogen, there is no atmospheric (vapor) form of phosphorus, and for this reason phosphorus is often a limiting nutrient in aquatic systems; when large amounts of phosphorus enter a lake or stream, plant growth is greatly increased, which can create water quality problems. Increased plant growth is coupled with increased decomposition, which depletes dissolved oxygen concentrations. Unlike nitrogen, phosphorus does not form any toxic by-products as phosphorus recycles through the ecosystem.

Dissolved oxygen (DO) concentration refers to the amount of oxygen contained in water. Fish and other aquatic organisms require oxygen for respiration, and oxygen dissolves in water mainly by two methods: directly from the atmosphere and as a by-product from plant photosynthesis.

Dissolved oxygen concentrations are generally controlled by six factors:

1) Temperature – warmer water holds less dissolved oxygen.
2) Atmospheric pressure – water at higher atmospheric pressure holds more dissolved oxygen.
3) Turbulence – increased turbulence or mixing will increase dissolved oxygen concentrations.
4) Plant growth – increased photosynthesis will result in increased dissolved oxygen concentrations.
5) Decomposition – increased decomposition uses dissolved oxygen from the water.
6) Ammonia concentrations – high ammonia concentrations in the water can also lead to low dissolved oxygen levels, as bacteria oxidize the ammonia to nitrate during a process known as nitrification.

Low dissolved oxygen concentrations in lakes and streams can result in the death of aquatic organisms, including insects and fish. When oxygen is lacking in the water column, a chemical reaction can occur that "unlocks" phosphorus from sediments where it would otherwise be tightly held. Released phosphorus can become re-suspended in the water column and fuel additional algal production.

The water column may also become *supersaturated* with oxygen (greater than 100% saturation). Supersaturation occurs as a result of excessive algae and plant growth. Supersaturation can indirectly result in low dissolved oxygen levels when the plant matter dies and bacteria consume oxygen to decompose the plant matter.

Oxygen depletion can be prevented by: keeping organic materials, like yard and pet waste, out of the water, using phosphorus-free fertilizer, using best management practices, like filter strips and grassed swales, to filter nutrients in runoff water, and properly maintaining septic systems.

Once absorbed, oxygen is either incorporated throughout the water body via internal currents or is lost from the system. Flowing water is more likely to have high dissolved oxygen levels than is stagnant water because of the water movement at the air-water interface. In flowing water, oxygen-rich water at the surface is constantly being replaced by water containing less oxygen as a result of turbulence, creating a greater potential for exchange of oxygen across the air-water interface. Because stagnant water undergoes less internal mixing, the upper layer of oxygen-rich water tends to stay at the surface, resulting in lower dissolved oxygen levels throughout the water column. Oxygen losses readily occur when water temperatures rise, when plants and animals respire, and when microbes aerobically decompose organic matter.

The background TP amount was determined by examining monitoring data from four watershed that have relatively few anthropogenic impacts with similar geologies, soil types and land-uses. Nutrient data was collected within the four watersheds during 2001 and 2002 as shown below in Table 3-2. The yearly TP average of these watershed ranged from 0.0314 to 0.0398 mg/L with a combined average of 0.035. This is the background value that was used in the TMDL loading calculation. A load allocation of 0.075 mg/L was established for these TMDLs.

Table 3-2. TP monitoring results used for as background.

Dates	Moose lower	Moose upper	WF Potlatch Cr	Big Creek-upper Dates	Value
12/27/2001	0.031	0.035	DNS	11/26/2001	0.047
1/8/2002	0.032	0.031	DNS	12/5/2001	0.036
1/22/2002	0.032	0.023	DNS	12/19/2001	0.057
2/4/2002	0.021	0.019	DNS	1/2/2002	0.047
2/19/2002	0.032	0.025	DNS	1/16/2002	0.043
3/4/2002	0.031	0.029	DNS	1/29/2002	DNS
3/18/2002	0.032	0.028	DNS	2/12/2002	DNS
4/1/2002	0.029	0.021	DNS	2/26/2002	DNS
4/14/2002	0.027	0.021	DNS	3/12/2002	DNS
4/30/2002	0.017	0.012	0.013	3/26/2002	DNS
5/13/2002	0.014	0.013	0.017	4/8/2002	0.1
5/30/2002	0.027	0.029	0.029	4/22/2002	0.042
6/11/2002	0.028	0.031	0.035	5/7/2002	0.036
6/25/2002	0.025	0.042	0.031	5/22/2002	0.051
7/10/2002	0.033	0.05	0.036	6/4/2002	0.044
7/24/2002	0.062	0.081	0.047	6/18/2002	0.067
8/7/2002	0.024	0.042	0.033	7/3/2002	0.044
8/21/2002	0.043	0.046	0.032	7/16/2002	0.042
9/4/2002	0.29	0.046	0.037	7/29/2002	0
9/19/2002	0.093	0.05	0.037	8/18/2002	0
10/3/2002	0.031	0.042	0.036	8/28/2002	0
10/15/2002	0.024	0.041	0.028	9/5/2002	0
10/30/2002	0.023	0.042	0.031	9/24/2002	0.066
11/14/2002	0.019	0.037	0.052	10/7/2002	0.058
11/26/2002	0	0.021	0.021	10/22/2002	0.05
12/11/2002	0.014		0.019	11/5/2002	0.12
				11/18/2002	0.062
	Moose -lower	**Moose-upper**	**WF Potlatch**		**Big Creek**
Averages	**0.0398**	**0.03428**	**0.0314**		**0.0365**
All 4 averaged	**0.035**				

[a] t/yr = tons per year
DNS = Did not sample

Bacteria

All six listed water bodies in the Palouse River Subbasin are 303(d)-listed for bacteria.

There are various types of bacteria in water:

- Harmful bacteria are found in within other bacteria microorganisms, virus and protozoa, and when ingested into body can cause sickness or even death.
- Other bacteria are able to cause illness by entering the body through abrasions in the skin; therefore, state standards are set at a level to protect human health.
- Some types of natural bacteria exist in the stream year round, these bacteria are fairly benign.
- *E-coli* bacterium is used by IDEQ as an indicator of these harmful bacteria organisms in a waterbody. All humans, and most warm-blooded animals, carry *E-coli* in the intestinal tract, making *E-coli* a good indicator of the more harmful types of bacteria to humans. *E-coli* and other harmful bacterium have a lifespan outside of the warm-blooded digestional tracks of about 24-30 hours, which is enough time for bacteria sources in the headwaters of a stream to move downstream throughout the entire stream and into other water bodies like the Palouse River. Therefore it is critical that all sources of bacteria be reduced and maintained within state standard to ensure the contract recreational beneficial use is protected.

Sources for bacteria include livestock, wildlife (especially waterfowl), humans, septic tank drain fields, and other domesticated warm-blooded animals. The 303(d)-listed water bodies for bacteria were sampled from November 2001 through November 2002 for *E-coli* organisms and total fecal coliform. Five out of the six 303(d) stream were in violation of the secondary contact recreational standard.

3.2 Data Gaps

This section discusses where additional monitoring to gather data could help clarify questions about water quality impairment. At the beginning of this subbasin assessment, a large data gap loomed in the forefront. Little or no data existed for nutrients, bacteria, sediment, or temperature. Some supporting data was available with the *Clearwater Biostudies* reports, and other flow and sediment data from the Forest Service but in limited areas. Therefore, a monitoring plan to gather baseline data for nutrients, bacteria, sediment and temperature was created, and data was collected from November 2001 through November 2002.

Collecting data during the above time frame was at times challenging, as access to the sites was limited during the winter due to weather conditions and snow levels. Getting samples to the laboratory was challenging, as well, as the bacteria samples had to be at a laboratory within 30 hours of sampling. Budget constraints also limited the extent of the sampling to one year and frequency (bi-weekly) of the sampling. In spite of these limitations, DEQ believes a credible database was established to adequately assess the condition of the 303(d)-listed water bodies with a reasonable degree of certainty.

Nonpoint Sources

Long term data on sediment, which originated from historic fires and mass failures, would be helpful. Gathering this data would be challenging, but understanding overall effects—specifically how these events affected the life histories of major fish species—could provide key information regarding sedimentation levels and fish conditions prior to European settlement. For example, there is very little data on the sediment condition of streams before the early 20th century fires or the large 1975-76 rain-on-snow event.

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4. Subbasin Assessment – Summary of Past and Present Pollution Control Efforts

This section describes some of the past and present water pollution control efforts in the subbasin.

Agricultural BMP Implementation

The Idaho Soil Conservation Commission contributed the following (Dansart 2004):

> The Soil Conservation Service (SCS) became active in the Palouse River Basin in 1935, five years before the first conservation districts in the area were organized. Major SCS activities included technical assistance to individual farmers and farmer groups planning and applying conservation on the land through Soil and Water Conservation Districts (SWCDs). The SCS (now NRCS) have worked in the North Fork of the Palouse Watershed through the Latah SWCD to assist with conservation planning and assistance. The Latah Soil Survey, which encompasses the watershed, was published in 1981; a new soil survey for the area is in progress and almost complete.
>
> The Agricultural Research Service (ARS) has conducted research to provide new agronomic alternatives for farmers in the Palouse and develop data to revise the Universal Soil Loss Equation (USLE). The Agricultural Stabilization and Conservation Service which later became the Farm Service Agency (FSA) has cost-shared, through various farm programs, implementation of selected conservation practices with landowners and operators in the watershed.
>
> According to DEQs 2003 survey of land uses in the North Fork Palouse watershed, an estimated 62,874 acres are in cropland, 18,361 acres are in hayland and 4,661 acres in pasture.
>
> The common crop rotation in the Idaho portion of the watershed today is either a winter wheat/spring cereal grain rotation, a winter wheat/spring cereal grain/spring legume (pea or lentil) rotation, or a winter wheat/spring legume rotation. Research has shown that maximizing residues from the previously harvested crop reduces erosion potential on the farm fields (RPU, 2004).
>
> Conventional tillage, which involves inverting much of the soil surface during multiple field passes, has been traditionally practiced on cropland in the watershed. No-till farming is gradually becoming utilized in the watershed. No-till farming includes using specialized equipment to place the fertilizer and seed directly into the previous year’s crop residue without performing prior tillage operations. At least in one leg of the rotation, it is common to see a no-till operation replace conventional practices. For example, winter wheat is often no-tilled into lentil, pea, or spring grain stubble, where the fertilizer is applied during the same operation as seeding. A few producers are implementing no-till operations for every leg of the rotation, which is

referred to as direct seed. This evolution of crop residue management throughout the subbasin has increased the over-winter crop stubble throughout the agricultural areas and decreased vulnerability of the soil surface to erosion. It is becoming more common for a no-till seeding operation to follow the low residue crop (lentils or spring wheat). Minimum tillage operations, designed to minimize ground disturbance and maximize surface residue cover, are used throughout the watershed (RPU, 2004).

USDA Farm Services Administration (FSA) and the Natural Resources Conservation Service (NRCS) administer and implement the federal Conservation Reserve Program (CRP) and Continuous Conservation Reserve Program (CCRP).

Agricultural lands with a previous cropping history are enrolled into CRP to remove highly erodable land from production. The land is converted into herbaceous or woody vegetation to reduce soil and water erosion. CRP contracts are for a minimum of 10 years. Practices that occur under CRP include planting vegetative cover such as introduced or native grasses, wildlife cover plantings, conifers, filter strips, grassed waterways, riparian forest buffers, and field windbreaks (RPU, 2004). Within the North Fork Palouse watershed, approximately 6350 acres have been removed from production and placed into permanent vegetative cover under the Conservation Reserve Program (CRP).

The CCRP focuses on the improvement of water quality and riparian areas. Practices include shallow water areas, riparian forest buffers, filter strips, grassed waterways and field windbreaks. Enrollment for these practices is not limited to highly erosive land, as is required for the CRP, and carries a longer contract period (10-15 years), higher installation reimbursement rate, and higher annual annuity rate (RPU, 2004). CCRP acres within the watershed are unknown at this time but are assumed to be fairly low.

The NRCS administers and implements the Environmental Quality Incentives Program. (EQIP) provides technical, educational, and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers and ranchers to comply with federal, state, and tribal environmental laws, and encourages environmental enhancement. The purposes of the program are achieved through the implementation of a conservation plan that includes structural, vegetative, and land management practices on eligible land. Five- to ten-year contracts are made with eligible producers. Cost-share payments may be made to implement one or more eligible structural or vegetative practices, such as animal waste management facilities, terraces, filter strips, tree planting, and permanent wildlife habitat (RPU, 2004). Several EQUIP projects are active in the watershed.

The Latah SWCD serves as the lead in administering the Section 319 funded AFO project which identifies problem areas and implements best management practices on confined animal feeding operations. The project was initiated in 2001 and continues to present; it involves five north-central Idaho Conservation Districts. Currently, only one project has been implemented within the North Fork watershed.

The Idaho Association of Soil Conservation Districts (IASCD), has performed water quality monitoring within the watershed under an agreement with DEQ through the Latah SWCD to assist in development of this TMDL.

The Idaho Soil Conservation Commission (SCC) staff provides technical and administrative support to Conservation Districts in Idaho. SCC has provided financial incentives under the Water Quality Program for Agriculture (WQPA) to supplement EPA 319 funds on agricultural lands. The intent of WQPA is to contribute to protection and enhancement of the quality and value of Idaho's waters by controlling and abating water pollution from agricultural lands. The program provides financial assistance to Soil Conservation Districts who conduct water quality planning studies and implement water quality projects.

Habitat Improvement

More people living on the Palouse are becoming interested in preserving native sites, and in reestablishing native environments in places where they have been destroyed. Some people are creating wetlands, performing stream side restoration projects and planting native plant species. Such restoration can involve a good deal of work and in time these sites will improve water quality, improve habitat and flow conditions, and help reestablish native habitats within the Palouse River Subbasin.

Forestry

The Idaho Forest Practices Act (FPA) is state policy and is legislatively mandated. A Forest Practices Advisory Committee composed of various interest groups has been established with the specific responsibility to review and improve forestry BMPs such that forest practices will be conducted using the latest economically sound information and practices to protect water quality. The committee conducts research into forest practice questions and gathers information from various sources, effectively providing a feedback loop for continuous improvement of forest practices. Many of the activities now being implemented in the Palouse River Subbasin to improve water quality are the direct result of improved practices and BMPs put in place by the FPA.

The FPA was codified during the mid-1970s to comply with Section 208 of the federal CWA. The FPA established mandatory rules and regulations leading to BMPs to be used during forest practices to protect surface water quality (IDL 1998). Espinosa et al. (1997) described estimated sediment delivery above USFS management plan goals from the 1950s through the 1970s, and noted that the awareness of watershed and habitat degradation problems helped to initiate a moderation of timber and road construction impacts in the early 1980s. On-site audits of FPA compliance were conducted in 1978, 1984, 1988, 1992, 1996, 2000, and 2004. Because of these audits, BMPs have been revised to promote better water quality protection.

Under the FPA, the forest industry and the state of Idaho have developed and are implementing a CWE process for forest lands in the state. The goal of this methodology is to systematically examine forested watersheds and identify on-the-ground cases where management may be contributing to water quality problems as defined by the CWA and state standards. When problems are identified, the process leads directly to corrective management prescriptions where the problem is occurring. CWE assessments have been completed on a significant portion of the state and private managed land in the Palouse River Subbasin. CWE reports define corrective management actions for each watershed where actual on-the-ground-conditions have been documented. These actions include BMPs based on FPA guidelines to ensure that forestry activities are not impairing water quality conditions. DEQ has been working closely with the FPA committee, IDL, and private industry to ensure BMPs are implemented, and will continue to do so.

Idaho Department of Lands (IDL)

The IDL has contributed the following:

> The Idaho Department of Lands performs a variety of pollution control efforts in the Palouse Headwaters. These efforts include efforts include enforcement of Forest Practice Act rules, Forest Practices Act education, Stewardship Forestry Assistance, Stewardship Cost-Share Programs, general forestry education, State endowment land management, and Minerals Act administration and enforcement.
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> The State Forest Practices Act (FPA) requires forest landowner compliance with forestry best management practices. Approximately 300 logging compliances are issued out of the Ponderosa Area office in Deary, Idaho. Approximately 120 inspections of logging operations are performed each year to ensure compliance with the FPA. These on-site inspections include review of road construction and maintenance, stream crossing construction, stream protection zone (SPZ) encroachment by equipment, and road/skidtrail locations.
>
> Stewardship Forestry Assistance includes on site visits with landowners providing education, information and technical transfer of forestry and stream side best management practices. The state administers the Stewardship Program which includes assistance to landowners through cost sharing forestry, riparian, and agro-forestry practices. The department also supports the Logger Education and Professionalism (LEAP) Program and Pro-Logger Program by providing workshops and training in the areas of logging bmp and Forest Practices rules. Topics presented in 2003 included “Installing Culverts to Meet Fish Passage Guidelines”. In 2004 presentations to logger groups covered Forest Practices rules regarding skid trail location and maintenance.
>
> The Idaho Department of Lands administers approximately 5,900 acres of endowment lands and McCroskey State Park within the Headwaters Palouse River watersheds. Administration of this land meets and exceeds the Forest Practices rules.

> Stream crossing structures are engineered to meet 50 year peak flows. Roads are inventoried and inspected on a periodic basis. Pollution (sediment and erosion) Management problems are identified and repaired as soon as weather conditions permit.
>
> Road maintenance activities performed in 2004, in the Headwaters Palouse drainages included road grading and cross-ditch maintenance of approximately 2.5 miles of road on the state ownership in Flannigan and Rock Creek. Timber sales in the Last Chance and Big Creek drainages in the mid and late 19990's maintained roads and installed new culverts to meet updated 50 year peak flow requirements and fish stream passage guidelines. Recent (2002, 2003, and 2004) active management of McCroskey State Park has resulted in maintenance of 7 miles of road including installation of additional culverts (Barkley 2004).

Clearwater National Forest, Palouse Ranger District

The federal Inland Native Fish Strategy (INFISH) standards were adopted in1995 and have been implemented on the federal forest lands within the Palouse River Subbasin. INFISH standards increased streamside buffer widths, improved trail and road construction practices, and required land managers to review grazing situations.

The CNF has contributed the following:

> Between 1992 and 2003, 21.2 miles of road have been obliterated on the Palouse, 16.1 miles abandoned and 1.5 put in intermittent storage. The majority of roads obliterated were high sediment producers, with high potential for mass failures, or streamside adjacent. Twenty-two miles were constructed during that time, frequently on ridge locations. BMP audits through 2003 had about 3500 BMP checks, with the most recent year showing 98% implementation and 99% effectiveness. Temperature monitoring sites number 11 in the Palouse drainage (Foltz 2004).

Potlatch Corporation

Potlatch Corporation has contributed the following:

> The most significant effort Potlatch Corporation has made to control pollution in the Palouse River sub-basin is in the form of sediment reduction and erosion control. Potlatch Corporation has recently implemented a comprehensive transportation plan. Road assessments are conducted in order to identify, prioritize, and schedule short-term and long-term needs for road maintenance, reconstruction, new construction, culvert replacement, abandonment, and obliteration. Cut and fill slopes are grass-seeded on all newly constructed roads to stabilize disturbed soil. Some of the new roads are temporary spur roads for harvest and silvicultural activities, and are abandoned or obliterated once the activities are complete. Access is controlled to most of the secondary dirt roads. Gated roads are only open to ATVs and non-motorized traffic during the wet-weather months. Since 2000, Potlatch Corporation

has obliterated 2.25 miles of road and abandoned 3 miles of road within the Palouse River watershed.

Potlatch has developed an environmental management system, which has earned ISO 14001 certification. Potlatch Corporation holds itself to a high standard of forest management and stewardship, and is also certified under the Sustainable Forestry Initiative (SFI) and the Forest Stewardship Council (FSC). Key to these standards are the requirements for stream management zones. Potlatch identifies and manages Class I riparian stands, which exceed Idaho FPA standards for best management practices (Watkins 2004).